



## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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<p>(21) International Application Number: PCT/US87/01435            (22) International Filing Date: 16 June 1987 (16.06.87)</p> <p>(31) Priority Application Number: 875,051            (32) Priority Date: 16 June 1986 (16.06.86)            (33) Priority Country: US</p> <p>(71) Applicant: OCCIDENTAL RESEARCH CORPORATION [US/US]; 10889 Wilshire Boulevard, Los Angeles, CA 90024 (US).</p> <p>(72) Inventors: MEGY, Joseph, A.; 3740 Chinquapin, Corvallis, OR 97330 (US). HARD, Robert, A.; Box 195A, Road No. 1, Spangsville Road, Oley, PA 19547 (US).</p>		<p>(74) Agents: LANE, William, G. et al.; Christie, Parker &amp; Hale, 350 West Colorado Boulevard, Post Office Box 7068, Pasadena, CA 91109-7068 (US).</p> <p>(81) Designated States: AT, AT (European patent), AU, BB, BE (European patent), BG, BJ (OAPI patent), BR, CF (OAPI patent), CG (OAPI patent), CH, CH (European patent), CM (OAPI patent), DE, DE (European patent), DK, FI, FR (European patent), GA (OAPI patent), GB, GB (European patent), HU, IT (European patent), JP, KP, KR, LK, LU, LU (European patent), MC, MG, ML (OAPI patent), MR (OAPI patent), MW, NL, NL (European patent), NO, RO, SD, SE, SE (European patent), SN (OAPI patent), SU, TD (OAPI patent), TG (OAPI patent).</p> <p>Published <i>With international search report.</i></p>

(54) Title: METAL POWDER AND SPONGE AND PROCESSES FOR THE PRODUCTION THEREOF

## (57) Abstract

Passified Zinc Soluble Metal-Based Metal particles having a controlled particle size distribution suitable for metallurgy usage without additional particle size reduction and process for making the same. Such metal particles are substantially free of halides, hydrogen, oxygen, nitrogen and carbon and are produced at temperatures considerably below that of arc melting temperatures of Zinc Soluble Metal-Based Metal and alloys based thereon.

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1 Summary of the Invention

This invention relates to the passified Zinc Soluble Metal-Based Metal particles which are substantially free of halides, and which are suitable for powder metallurgy usage 5 without further particle size reduction, and processes for the production thereof. "Particles" as used herein is meant to include powders and granules as well as particles.

Zinc Soluble Metal-Based Metal is a metal or a mixture or alloy of two or more of such metals that has a solubility 10 of at least about 3% by weight in molten zinc at 900°C. The Zinc Soluble Metal-Based Metal can contain alloying agents that do not meet the solubility, vapor pressure and melting point criteria of the Zinc Soluble Metal-Based Metal. Although antimony has a melting point of less than 900°C, 15 alloys or mixtures of antimony and/or lithium and Zinc Soluble Metal-Based Metals are considered Zinc Soluble Metal-Based Metals when the alloys or mixtures meet the above solubility, vapor pressure and melting point specifications. The Zinc Soluble Metal-Based Metals of the present 20 invention are Ti, Mn, Fe, Co, Ni, Cu, G, Y, Zr, Rh, Pd, Ag, Sb, La, Pr, Nd, Sm, Gd, Tb, Dy, Ho, Er, Tm, Lu, Hf, Pt, Au, Ac, Th, Pa, U and mixtures thereof, including alloys thereof. The mixtures and alloys consist essentially of one or more Zinc Soluble Metal-Based Metals and lesser 25 amounts of other elements; provided, however, that such mixtures and alloys can contain up to 50% or more by weight of the other elements if the resulting mixtures and alloys meet the above solubility, vapor pressure, and melting point specifications.

30 A very important advantage of this invention is the capability of producing metal shapes, i.e., near net shapes, directly from metal sponge particles without the necessity of any expensive arc melting step which is required in conventional technology for consolidation or alloying of 35 the Group IVb transition metals.

SUBSTITUTE SHEET

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1 Such metal values will comprise essentially the pure  
zinc Soluble Metal-Based Metal or mixtures or alloys thereof  
optionally containing other alloying agents desirable in  
the ultimate final product, that is, alloys thereof. For  
5 example, such other alloying agents which may be desirable  
in the final product and known to those skilled in the art  
include, but are not limited to, beryllium, boron, carbon,  
oxygen, aluminum, silicon, phosphorus, calcium, vanadium,  
chromium, arsenic, selenium, gallium, polybdenum, cadmium,  
10 iridium, tin, cesium, niobium, barium, thallium, lead,  
bismuth, zinc and the like. These other elements may be  
used in the processes described herein.

Such alloying agents may be incorporated in small  
amounts as, for example, less than 5 weight percent  
15 individually and less than 10 weight percent collectively,  
because of limited solubility in molten zinc or because  
they possess a low boiling point as, for example, a boiling  
point below 900°C. However, the Zinc Soluble Metal-Based  
Metal containing the alloying agents must have a boiling  
20 point above 1000°C to prevent loss of the alloying agents  
during the zinc sublimation stage of the Metal values-zinc  
alloy.

Zinc Soluble Metal-Based Metals containing such other  
alloying agents will consist of a major portion of Ti, Mn,  
25 Fe, Co, Ni, Cu, Ge, Y, Zr, Rh, Pd, Ag, Sb, La, Pr, Nd, Sm,  
Gd, Tb, Dy, Ho, Er, Tm, Lu, Hf, Pt, Au, Ac, Th, Pa, U and  
mixtures thereof, and a minor portion of alloying agents,  
such as B, C, O, N, Al, Si, P, Ca, V, Cr, As, Se, Ga, Mo,  
Cd, Ir, Sn, Cs, Nb, Ba, Pb, Bi, Zn and mixtures thereof.  
30 The alloying agents made up the minor portion of the Metal  
values. Typically each alloying agent, if present, is  
alloyed in the Metal values in the following amounts, in  
weight percent:

35           B     0-7.0  
              C     0-7.0  
              O     0-2.0

**DERWENT-ACC-** 1987-362657**NO:****DERWENT-** 198751**WEEK:****COPYRIGHT 1999 DERWENT INFORMATION LTD****TITLE:** Metal powder and sponge - contg. metal particles of specific size obtd. by forming an alloy of the metals with zinc and heating**INVENTOR:** HARD, R A; MEGY, J A**PATENT-ASSIGNEE:** OCCIDENTAL RES CORP[OCCI]**PRIORITY-DATA:** 1986US-0875051 (June 16, 1986)**PATENT-FAMILY:**

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WO 8707547 A	December 17, 1987	E	064	N/A
AU 8776452 A	January 11, 1988	N/A	000	N/A
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**DESIGNATED-STATES:** AT AU BB BG BR CH DE DK FI GB MW NL NO RO SD SE SU AT BE CH DE FR GB IT LU NL OA SE AT BE CH DE FR GB IT LI LU NL SE**CITED-DOCUMENTS:** US 3119685; US 4356029 ; US 4390365 ; US 4445931 ; US 4470847 ; US 4477277 ; US 4655825 ; WO 8600550**APPLICATION-DATA:**

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**INT-CL (IPC):** B22F001/00, B22F009/22**ABSTRACTED-PUB-NO:** WO 8707547A**BASIC-ABSTRACT:**Particles of Al, Ti, Mn, Fe, Co, Ni, Cu, Ge, Y, Zr, Rh, Pd, Ag, Sb, Hf, Pt, Au, Pr, U, or mixtures of these, or of alloys of Al, Ti, Mn, Fe, Co, Ni, Cu, Ge, Y, Zr, Rh, Pd, Ag, Sb, La, Pr, Nd, Sm, Gd, Tb, Dy, Ho, Er, Tm, Lu, Hf,

Pt, Au, Ac, Th, Pa or U with minor amts. of B, C, O, Si, P, Ca, V, Cr, As, Se, Ga, Mo, Cd, Ir, Sn, Cs, Nb, Ba, Th, Pb, Bi or Zn have a particle size less than 30 mesh, less than 50ppm. halide and internal porosity of 5040 vol.%.

The particles are obtd. by forming an alloy of the pref. metals and elements with zinc, the alloy being free of halide and then heating the alloy between 500 deg. and 1150 deg.C to eliminate all zinc. The prod. is then sintered at 850 deg. to 1250 deg.C. The zinc alloy may be comminuted or atomised prior to zinc distn., alternatively the sintered sponge may be hydrided followed by comminution and then removed of hydrogen. Where necessary the final prod. in all cases is passivated by treatment with oxygen or nitrogen.

USE/ADVANTAGE - Prodn. of material for powder metallurgical processes. The material is halide-free and of a size suitable for use without further redn..

**CHOSEN-** Dwg.0/6

**DRAWING:**

**TITLE-TERMS:** METAL POWDER SPONGE CONTAIN METAL PARTICLE SPECIFIC SIZE  
OBTAIN FORMING ALLOY METAL ZINC HEAT

**DERWENT-CLASS:** M22 M26 P53

**CPI-CODES:** M22-H01;

**SECONDARY-ACC-NO:**

**CPI Secondary Accession Numbers:** C1987-155344

**Non-CPI Secondary Accession Numbers:** N1987-271850